CLAIMS

1. A semiconductor device having an element forming region where a semiconductor element is formed and an element non-forming region where a semiconductor element is not formed, on a front surface of a silicon substrate, comprising

a groove formed in a portion of a rear surface of said substrate corresponding to said element non-forming region.

2. The semiconductor device of claim 1,

wherein a plurality of said grooves are formed.

3. The semiconductor device of claim 2,

wherein said grooves are formed parallel to each other.

4. The semiconductor device of claim 2,

wherein said grooves are formed to extend in directions crossing each other.

5. The semiconductor device of claim 4,

wherein said grooves are formed to extend in directions which cross substantially perpendicular to each other.

6. The semiconductor device of claim 4,

wherein said grooves are formed to extend in three

different directions.

7. The semiconductor device of claim 1,

wherein said groove has a substantially uniform width from a bottom portion to an opening portion of said groove.

8. The semiconductor device of claim 1,

wherein said groove has a wider width in an opening portion than in a bottom portion of said groove.

9. The semiconductor device of claim 1,

wherein said groove has a bottom portion with a curved surface.

10. The semiconductor device of claim 1,

wherein said groove is filled with a material softer than said silicon substrate.

11. The semiconductor device of claim 1,

wherein the rear surface of said silicon substrate is coated with a material softer than said silicon substrate.

12. The semiconductor device of claim 1,

wherein a plurality of said element forming regions are isolated from each other, and said element non-forming region is a

region sandwiched between said element forming regions.

13. A semiconductor device module comprising a semiconductor device bonded to a bonding substrate,

wherein said semiconductor device has an element forming region where a semiconductor element is formed and an element non-forming region where a semiconductor element is not formed, on a front surface of a silicon substrate, and a groove formed in a portion of a rear surface of said silicon substrate corresponding to said element non-forming region.

14. The semiconductor device module of claim 13,

wherein said bonding substrate is curved.

15. The semiconductor device module of claim 13,

wherein said bonding substrate is formed to be capable of being curved.

16. A manufacturing method of a semiconductor device having an element forming region where a semiconductor element is formed and an element non-forming region where a semiconductor element is not formed, on a front surface of a silicon substrate, said method comprising the steps of:

forming a semiconductor element in a predetermined region of the front surface of said silicon substrate; and

grinding a rear surface of said silicon substrate so as to form a groove in a portion corresponding to the region where a semiconductor element is not formed.

17. A manufacturing method of a semiconductor device having an element forming region where a semiconductor element is formed and an element non-forming region where a semiconductor element is not formed, on a front surface of a silicon substrate, said method comprising the steps of:

forming a semiconductor element in a predetermined region of the front surface of said silicon substrate; and

etching a rear surface of said silicon substrate so as to form a groove in a portion corresponding to the region where a semiconductor element is not formed.

18. The manufacturing method of a semiconductor device of claim 17,

wherein said etching is dry etching.

19. The manufacturing method of a semiconductor device of claim 17,

wherein said etching is wet etching.

20. A manufacturing method of a semiconductor device module comprising a semiconductor device bonded to a bonding

substrate, comprising the steps of:

manufacturing the semiconductor device having a groove by forming a semiconductor element in a predetermined region of a front surface of a silicon substrate and grinding a portion of a rear surface of said silicon substrate corresponding to a region where a semiconductor element is not formed; and

bonding the semiconductor device to a flat bonding substrate by holding the semiconductor device with a holding tool having a flat holding surface.

21. A manufacturing method of a semiconductor device module comprising a semiconductor device bonded to a bonding substrate, comprising the steps of:

manufacturing the semiconductor device having a groove by forming a semiconductor element in a predetermined region of a front surface of a silicon substrate and etching a portion of a rear surface of said silicon substrate corresponding to a region where a semiconductor element is not formed; and

bonding the semiconductor device to a flat bonding substrate by holding the semiconductor device with a holding tool having a flat holding surface.

22. A manufacturing method of a semiconductor device module comprising a semiconductor device bonded to a bonding substrate, comprising the steps of:

manufacturing the semiconductor device having a groove by forming a semiconductor element in a predetermined region of a front surface of a silicon substrate and grinding a portion of a rear surface of said silicon substrate corresponding to a region where a semiconductor element is not formed; and

bonding the semiconductor device to a curved bonding substrate by holding the semiconductor device with a holding tool having a curved holding surface.

23. The manufacturing method of a semiconductor device module of claim 22,

wherein the holding surface of said holding tool has a shape corresponding to a curved shape of a bonding surface of said bonding substrate.

24. A manufacturing method of a semiconductor device module comprising a semiconductor device bonded to a bonding substrate, comprising the steps of:

manufacturing the semiconductor device having a groove by forming a semiconductor element in a predetermined region of a front surface of a silicon substrate and etching a portion of a rear surface of said silicon substrate corresponding to a region where a semiconductor element is not formed; and

bonding the semiconductor device to a curved bonding substrate by holding the semiconductor device with a holding tool

having a curved holding surface.

25. The manufacturing method of a semiconductor device module of claim 24,

wherein the holding surface of said holding tool has a shape corresponding to a curved shape of a bonding surface of said bonding substrate.